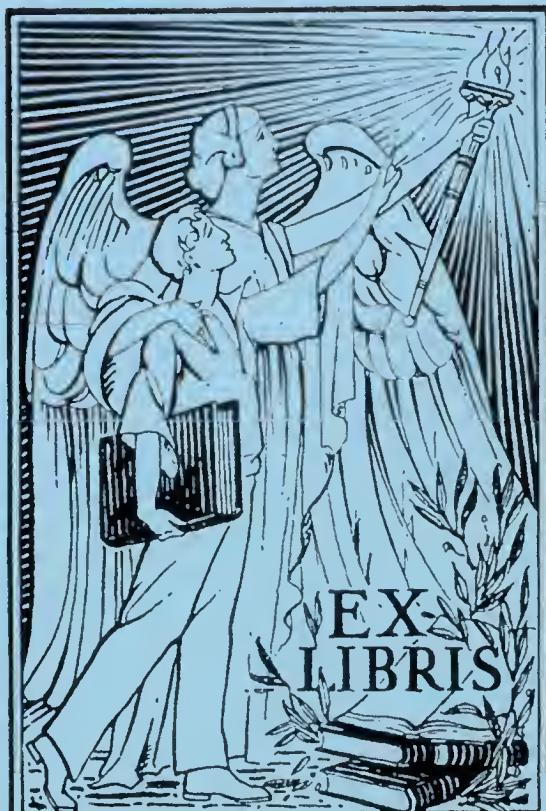


Fox, C.B.

Industrial psychology applied to the
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Industrial Psychology applied to the Blind¹

By C. B. FOX

ALTHOUGH it is not the purpose of this lecture to deal in any detail with the *general* psychological problems of blindness and popular conceptions relating thereto, yet some of them bear directly on the work of the industrial psychologist. Two popular conceptions have arisen because it is so difficult for a sighted person even to imagine how he could move about, work, etc., were he to become blind ; so dependent is he upon sight that it is almost incredible that blindness should not be a serious handicap to almost any activity. And thus have appeared the two following beliefs.

THE 'SIXTH SENSE'

The first attributes to the blind a 'sixth sense'—a vague expression which has been utilized to explain the success of the blind in terms of a fictitious psychology. If this sense existed it would immediately raise a series of problems for the industrial psychologist : How does it act ? How can it be utilized ? For what types of work can it be used ? How and to what extent can it be developed by training ? But unfortunately it does not exist. The truth of the whole matter is that the sixth sense which some people are apt to attribute to the sightless is merely the result of utilization of the other senses to their fullest capacity. In other words, the blind have, apart from sight, the same sensory equipment as normal persons.

INTENSIFICATION OF SENSES OF TOUCH AND HEARING

Then there is the second belief—that when we are deprived of one sense, Nature compensates us by an intensification of the other senses. The blind are supposed to possess an exceptionally keen sense of touch and hearing. It is true that they do. But they have attained it only through constant practice and utilization of these senses so as to adapt them for their own distinctive environment. Any sighted person could develop these senses to the same degree by constant use.

¹ Based on a lecture delivered to Members of the Institute at the London School of Economics and Political Science on December 11, 1930.

THE FALLACY OF PITY

One of the general problems with which I want to deal is the attitude adopted by the sighted towards the blind. The blind do not want pity. Given the opportunity, they can be useful and happy members of the community. They want opportunity—not a facile, emotional pity. This fact has been admirably expressed by the late Sir Arthur Pearson.

"Happiness comes from doing, from exercising one's creative faculties, whatever they may be ; and he who finds ample opportunity for fundamental expression needs no one's pity. (This is the only sane and constructive method of charity except for the sick and aged, and almsgiving should be looked upon with disfavour.) Don't pity the blind. They don't want your pity, and they can't use it if you give it to them. There *is* something they want, and something for which they have a right to ask—that is, the normal spirit you are willing to extend to equals everywhere. Co-operate with the blind man, and you will both be stronger for it. Pity him, and you will both be weaker. Pity exhausts the giver and demoralizes the recipient."

OCCUPATIONS SUITABLE FOR THE BLIND

The National Institute of Industrial Psychology in its study of the blind is engaged upon just this problem of helping them to become useful and effective members of the community. With this purpose, it first set out to discover in what occupations, other than those conducted in the existing blind workshops, the blind could most usefully be employed. Visits were paid to the principal training institutions and workshops for the blind in and near London, and the occupations in which blind persons are engaged were studied in some detail. Subsequent visits were paid to several workshops in the provinces, but no marked departure was discovered from the methods and processes employed in London. In fact, the general uniformity in the nature of the occupations carried on and in the methods of working was a rather striking feature of all the workshops.

It is true that in some respects each workshop possessed an individuality of its own, but it was generally expressed only in comparatively minor processes. Some institutions, for instance, had developed a local market for some specialized product. But, in general, all the workshops were primarily occupied in producing the

baskets, mats, brushes, machine-knitted goods and other well-proved products with which the blind have been for so many years associated.

A careful examination of the experiments conducted in other countries was made. But here, although there was a considerable amount of information available, for the most part it lacked definiteness in such important particulars as earnings, efficiency, etc. Visits were then paid to factories employing sighted labour in order to explore the possibilities of the factory employment of blind persons. A list was made of the occupations which, it was thought, the blind could satisfactorily follow.

THE BLIND IN TELEPHONE MANUFACTURE

Arising out of one of the earliest of these visits, a suggestion was made for the experimental employment of blind persons on a repetitive factory process, and a definite offer of work for a short period on a sub-contracting basis was eventually obtained from the manager of a factory. The experiment lasted nearly three months. The repetitive process employed was one which is commonly employed in telephone manufacture. It consists in 'forming,' *i.e.* fastening together a number of wires in such a way that when the completed 'form' is inserted in the part of the telephone for which it is intended, the necessary connections can at once be made. The wires used are of varying lengths and colours, and a wooden board with the holes bored at appropriate points is used to control the position of each wire in the finished 'form.' The wires are threaded through the holes according to a fixed scheme and are then wound together with waxed thread.

Psychological analysis shows that skill in carrying out a movement depends both upon muscular control, which is independent of vision, and upon visual control. In writing, for example, although the movements are almost automatic, vision controls the alignment of the writing and prevents degeneration in the form of the letters. It is well known that a blind man's handwriting degenerates considerably even when other controls such as raised lines are used.

SUPERIORITY OF THE PARTIALLY TO THE TOTALLY BLIND

It would seem, therefore, that a blind person can acquire real skill only in those activities which are truly independent of

vision in the sense that *effective* substitutes for visual control can be developed.

The experiment on 'forming' fully confirmed this belief. Those who became most proficient in the work were those who retained a sufficient degree of vision to identify forms and colours. To what extent they used their eyes it is impossible to say, but their superiority in output can hardly be due to chance. This is even more clearly demonstrated by tests of manual dexterity which will be described immediately, and which were devised for the specific purpose of determining what rôle the degree of vision does play. It was quite clear that the time taken by a totally blind person is much greater than that taken by one who can see a little, simply because the latter spends so much less time in groping for his material. Although this groping may be much reduced by suitable layout and by special apparatus, it cannot be removed altogether, and the output of the blind worker must in consequence be reduced.

TESTS OF MANUAL DEXTERITY FOR THE BLIND

In the early stages of the Institute's efforts to determine the capabilities of the blind, the need was felt for special information on the relation between success at work and degree of vision, previous training, and similar important contributory factors. For this purpose, tests were devised to estimate manual dexterity. These tests were four in number and were : (i) a peg-placing test in which pegs are placed in holes in a board ; (ii) a similar peg-placing test in which the thumb and the other fingers of the preferred hand are used independently in turn ; (iii) a test in which nuts are threaded on small bolts (both hands) ; (iv) a test of screw-twisting in which wrist movements are dominant.

These tests were given to each worker individually and in private under constant experimental conditions. Consequently, direct comparison could be made between workers of all kinds irrespective of their trade and workshop. It was, however, important to discover whether special training in such occupations as basket-making affected the test results, and comparisons were therefore made between workers grouped under trades.

The following results were obtained from these tests of dexterity :

- (a) *Influence of Age.*—In straightforward pegging and in the assembly of nuts and bolts there was a progressive reduction in speed from the age of about twenty. In the screw-twisting test, however, with the exception of the older totally blind, there were no marked differences in score between one age-group and another.
- (b) *Influence of Vision.*—The difference between the partially and the totally blind was similarly very marked in the peg-board and nuts and bolts tests, but not in the screw-twisting test.
- (c) *Influence of Trade* (for both partially and totally blind).—In two of the tests, the boot repairing group showed a marked superiority to the other trade groups, while the poor performance of the mat and brush makers in all the tests was outstanding.

STUDY OF WAGE RECORDS

While these tests were being conducted at the various workshops, the wage records of the workers in each department were studied in some detail. The amounts paid weekly to each worker (exclusive of augmentation) were abstracted from the wages records for as long a period as could be conveniently obtained. In most cases records over two years or more were available, so that it was possible to compare the average weekly wage earned by each worker during the quarter under review with his average wage during the corresponding quarter two years or one year previously. It was hoped that the average weekly wage calculated for the quarter would be sufficiently representative of the worker's 'economic value' to justify comparisons between one period and another. Comparisons between wages in different workshops could not, of course, be attempted, for even if the wage recorded could be taken strictly to represent 'real earnings,' which in some cases seems doubtful, the conditions and methods of payment vary from one place to another. But within each workshop, it has been possible to show how the various classes of blind persons differ in earning capacity.

For purposes of comparison the blind men were divided into two classes—the partially blind and the totally blind. The totally blind

are those whose vision is limited to distinction of light and dark (with or without the ability to name the primary colours), and whose recognition of objects is uncertain even when they are large; while the partially blind include the remaining blind persons who come within the meaning of the Act in having vision less than 6/60 of normal.

In interpreting the data collected, reference must be made, of course, to the average experience of those who constitute the groups, but this is complicated by the fact that the effects of experience can only be guessed. It is reasonable to assume that increase in experience brings with it an increase in skill, and therefore in earning capacity, but these increments do not go on indefinitely. Probably after a period of more or less constant capacity, the influence of increasing age will show itself in a reduction of output. At what age, in the case of the totally blind and the partially blind, are we to expect this effect to show itself? The figures suggest that in almost all the workshops the maximum earning capacity tends to fall for the larger groups within the years thirty to forty. This seems to hold for men and women, and for partially and totally blind alike, but the effect may be obscured by differences in experience within each age group. Since the age at which the person becomes blind varies greatly, the average experience of the age-groups given does not always increase proportionately. On the whole, the variations in earnings are small.

A rearrangement of the data according to length of experience does not help greatly, since there are too few cases to allow of subdivision into groups equal in both age and experience. There is, however, a general tendency for earning capacity to increase during a period of ten or eleven years and thereafter to decrease.

Much larger differences are seen, however, when the earnings of the partially blind and the totally blind are compared. The relative efficiency of these groups as shown by the wage records is substantially in favour of the partially blind. Although the effects of age and experience are not wholly excluded, the general trend of the differences in earnings is unmistakable. A composite figure for the average earnings of the partially blind, as compared with those of the totally blind, would be misleading unless the average experience of each group were substantially the same and the numbers approximately equal.

'ISOLATION' OF BLIND WORKERS

On the completion of the tests and preliminary work, the problem remained of increasing the usefulness of the workers in blind institutions. One important peculiarity of the blind was soon noticed—their relative 'isolation.' It is impossible for the blind worker to be informed of the various happenings in the shop or of what others are doing, without inquiring from each of his neighbours. This causes a considerable delay due to the loss of rhythm or slowing-up of the rate of work. On account of this restricted environment and lack of external stimuli many of the blind become very self-centred and reflect to a large extent on their own problems. This 'brooding' is often the cause of many of the difficulties encountered when dealing with the blind: it tends to lower the vitality and, after some time, the production of the worker.

One of the most encouraging features of an experiment in team work conducted by the Institute in the basket department of a blind institution was the very noticeable way in which it tended to break down the isolation of the blind worker. Each member of the team took a considerable interest not only in the progress of the experiment as a whole, but also in the work of each man. After the first two days the team were left from time to time to carry on without supervision. Each man soon took a share in the extra work involved in keeping the materials and baskets in circulation, but the efficiency of the team was hardly impaired thereby. There seems to be little doubt that part of the success of this experiment was due to the overcoming of the isolated introspective state of the blind. If more ways of overcoming this relative isolation could be introduced into the methods of blind workshops, a greater co-operation and a more healthy spirit would prevail not only amongst the blind themselves, but also in their relations with their sighted colleagues.

AN EXPERIMENT IN SUBDIVISION OF WORK

In basket departments belonging to blind workshops it is customary for each worker to make an entire basket. An experiment, however, was undertaken by the Institute in which the manufacture of a basket was divided into four parts: (i) the bottom; (ii) the staking and

'upsetting'; (iii) the siding; (iv) the border and foot. Four volunteers were taken, each making only one of the above parts of the basket.

The material for the baskets was prepared by the Institute's investigator, who also took the basket from one worker to another since the volunteers were not working side by side.

After making due allowances for the preparation of material and any assistance in finishing, output under the new system was found to be 25.2 per cent. higher than under the old, with a considerably more regular flow of production.

TEAM-WORK AND CRAFTSMANSHIP

It has been suggested that team-work may tend to decrease the sense of craftsmanship among the blind in the basket-making trade. Each trainee, however, has to learn methods of making complete samples of each kind of basket before he is considered proficient. It is usually found both convenient and profitable in the workshop for a man to specialize on three or four types of baskets. The number of orders in which the subdivision of labour above described could be successfully carried out would not be large enough to interfere seriously with the sense of craftsmanship or with the ability of the employee to make several types of basket satisfactorily.

BLIND EMPLOYEES AT CADBURY BROTHERS LTD.

In this connection it is worth while mentioning the result of a visit to the factory of Cadbury Bros. Ltd. during which the work of a team of blind girls was carefully studied. Their efficiency relative to the average factory worker is shown in the following figures supplied by Miss Cadbury, who was personally responsible for the arrangements made in connection with their work. When the team is made up of two normal sighted and five blind girls, the output of the team is 84 per cent. of normal sighted teams. Increase in cost is approximately 2 per cent. (girls' wages only). When the team is made up of three normal sighted and four blind girls, the output of the team is usually 91 per cent. of normal sighted teams. Increase in cost is approximately 1 per cent. (girls' wages only). To quote from Miss Cadbury's report: "The blind girls earn the same amount as the sighted teams. This is due to the fact that they work only on the lighter and better paid packings. They also receive more assistance from the men."

We were told also that the normal sighted girls in the mixed team are paid slightly more than the average because they have more work to do in maintaining the output of the team. In other words, the burden of maintaining the efficiency of the team falls upon the sighted members of it. During our own observations of the girls at work, it was apparent that the steady flow of packed cartons depended greatly upon the watchful eyes of the two leaders of the team. An extra prepared carton slipped in here, a set of labelled tins taken out there or an extra package tied up later on undoubtedly made a big difference, not only in keeping the flow of work constant, but in removing any feeling of strain which might arise from the realization of the blind worker that the work was 'piling up' against her.

This kind of help being necessary when the girls are able to see a little, we can easily imagine its amount when the workers are totally blind. It is true that the processes being performed at Messrs. Cadbury's are simple and apparently well within the capacity of a totally blind person; but the vital point is speed of movement, and one may reasonably doubt whether the average totally blind person could ever attain the speed which is necessary.

PROPORTION OF NUMBER OF WORKERS TO SIGHTED SUPERVISOR

In different institutions there proved to be wide variations in the proportion of sighted staff supervising the work of the blind. Considerable differences were also noted in the wages earned by different blind workers. In order to determine if the one feature has any definite relation to the other, a questionnaire was prepared and forwarded to all the blind institutions in the country—not only for the basket-making industries, but for all trades conducted by the blind. Replies have been received and are now being thoroughly examined to determine to what extent this supervision affects the efficiency of the blind, once they have become proficient in their trade.

LAYOUT OF RAW MATERIAL

Unless specific attention is paid to layout, time is inevitably wasted by blind workers in groping for their implements or material. In a basket-making department in one institution a rack was designed by the Institute to contain the cane from which the basket was made.

Since the material was then placed in a definite position and was easily withdrawn from its receptacle, the time available for actual productive work was increased, and an increase in output of 10 per cent. resulted.

A detailed investigation was also made in a knitting factory employing blind labour. Here the layout of the factory was studied in detail, and methods of work carefully examined and amended, and methods were devised to reduce waste of time and material. A system of planning was introduced in order that the factory might be able to supply goods on the dates promised, while by rearrangement increased storage accommodation was made available on the same floor area. By reduction of waste, etc., savings of over £1,000 per annum were effected, together with an increase of £1,350 per annum in the turnover.

FUTURE WORK

The field covered by these investigations, though wide, is only a fraction of the whole area available for study. The Institute has examined in some detail the processes suitable for the blind and the selection of suitable blind persons to train for them. But this work can be largely extended and intensified by (i) the vocational selection of the blind for training for specific industries ; (ii) research into the methods adopted for training blind pupils in various industries ; (iii) detailed studies of the trades followed by the blind to eliminate waste of time, labour and material, etc. ; and (iv) training the blind and organizing their employment in factories with the assistance of sighted labour so that they shall attain their maximum efficiency. For this purpose methods must be introduced to secure the co-operation of the employers and the management in these 'sighted' factories.

A somewhat different set of problems is presented by the more highly educated blind. Here again, work must be done to find careers and professions. The limitations imposed on the education of the blind by their blindness must be studied, and the best methods of giving vocational education in view of these limitations remains yet to be determined. Further, there is the need for an exploration of methods of placement when vocational education is finished.

The investigation described in this paper indicates how much the Institute has already done to help the blind and how much has yet to be done. The foundations have been laid, and a skeleton super-structure has been erected. The skeleton has now to be clothed.

Notes of News

THE Annual Meeting of the Institute will be held on April 17 at 5.30 p.m. at the Royal Society, Burlington House. Sir Frederic Hopkins, D.Sc., President of the Royal Society, will be among those who will address the meeting, and Viscount D'Abernon, President of the Institute, will be in the chair.

On May 1 at 6 p.m. a meeting of Members of the Institute will be held at the Royal Society of Arts. Sir Arnold Wilson, K.C.I.E., C.S.I., C.M.G., D.S.O., Chairman of the Industrial Health Research Board, will be in the chair. Miss S. M. Bevington, B.Sc., of the Institute's staff, will read a paper on "Causes of Juvenile Drifting," and Mr. A. H. Seymour, B.Sc., also of the Institute's staff, on "Personnel Work in Modern Industry." Invitation cards will be sent to Members in due course.

In connection with the National Safety Week, a public lecture on Practical Tests for Drivers will be given by Dr. G. H. Miles, Director of the Institute, at the Royal Automobile Club at 5.30 p.m. on May 12.

On May 22, by kind permission of the Orient Line, Ltd., a visit will be paid by Members of the Institute to the S.S. *Orama*, in the steward department of which the Institute has carried out an investigation. The liner will be in dock at Tilbury. The exact time and place of meeting will be announced on the invitation cards, which will be sent to Members.

By kind co-operation of Sir Henry Lyons, F.R.S., the Director, it is hoped to invite some 1,200 people to a conversazione at the Science Museum, South Kensington, in June. Invitations to Members of the Institute and guests will be forwarded in due course.

It is hoped to arrange a further course of lectures, beginning next October, for employment managers, welfare workers and others possessing industrial experience. Fifty-six persons, representing twenty-five industrial firms, have attended the two courses already given.

Under the Heath Clark Bequest, the Institute has arranged for a course of three public lectures on Recent Research into Industrial Accidents to be delivered by Mr. Eric Farmer, M.A., of the Industrial

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